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Bridging the Gap Between Business Decision and Process Modeling

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ABSTRACT

Unlike business modeling research, real life business problems are rarely split along the disciplinary lines of process and decision modeling. Integration of the two types of business modeling has the potential to offer business more effective decision support while increasing the power of existing modeling tools. This paper suggests a framework for integration of business process and decision models and outlines the methodology to derive an integrated business decision support tool that is based on these models.

1 INTRODUCTION

Business modeling [9] has been the focus of extensive research effort within a variety of related disciplines such as process and information modeling, decision analysis, business dynamics and quantitative modeling [2, 4, 9, 10, 14, 15, 16]. Unfortunately problems faced by real life businesses are rarely separated along these disciplinary lines. For example, a process model originates from information systems design and software engineering [3, 5, 6] and provides a holistic view of the business as an entity focused on specific outcomes achieved through a sequence of tasks [7, 8] but fails to provide effective decision support. On the other hand, decision models originating from operations research provide effective decision support to the business but tend to be prescriptive and very specific, mirroring the operations research requirement to significantly simplify the problem in order to achieve an optimal solution [2, 16].

Note that the modeling features that can be regarded as relative weaknesses for one of these classes of tools, are, in fact, the strong points for the other suggested class. It is, therefore, natural to expect that a suitable combination of process- and decision- modeling approaches would increase the power of the resulting business modeling tool and better address the real-life problems faced by business.

The objectives of this paper are to identifying opportunities for integration and to outline the methodology for deriving an integrated tool based on process and decision models with the aim of developing a modeling tool that better reflects the nature of business decision support.

A generic decision making model is introduced in Section 2. A brief discussion of process modeling tools is provided in Section 3. In Section 4 a new concept of a decision enabled process modeling tool and its benefits for business decision support are discussed. This is followed by a discussion of a single logical framework for business process and decision modeling tools presented in Section 5.

2 MODELING AND DECISION MAKING CONTEXT

A generic decision-making situation can be typically characterized by a set of actions, constraints, states of the world, outcomes, optimality criteria and objectives. Depending on a particular situation, some of these elements may be absent, however sets of actions, constraints, outcomes and objectives must be non-empty. A rational model typically used for decision support is aimed at modeling *a choice from possible actions or alternatives to satisfy one or several decision objectives within the context of a decision situation* [2, 16].

Mathematical techniques and programming routines that are used to solve decision models constitute a subject of extensive operations research literature. For the purpose of this paper, it is assumed that once the *quantitative decision model* is formulated, it can be solved using one of the existing mathematical and/or programming routines. Due to the complex technical nature of these models they are often prescriptive addressing simplified decision problems with narrow decision objectives. More user-friendly decision models dealing with the structure of and interactions between the decisions (e.g. decision analysis and system dynamics tools) provide a more holistic view of the decision situation at the expense of their ability to support specific decisions [2, 4, 14].

3 PROCESS MODELING TOOLS: EVENT-DRIVEN PROCESS CHAINS AND THEIR PROPERTIES

An Event-driven Process Chain (EPC) is a business process modeling tool that is widely used to model the function flow of the business process as a sequence of events and functions with the events being function triggers and results [7, 8, 11, 12]. An EPC can be formed at the various levels of the business process. Each process can be broken down into a chain of events and functions with each function aimed at achieving organizational goals.

A concept of an extended EPC (e-EPC) developed by Scheer [11, 12] provides an even more complete description of the consolidated business model allowing various business interactions to be modeled through different views of the e-EPC, such as *Data View*, *Function View*, *Output View*, and *Organization View*. The concept of views avoids the complexity of an "all-in-one" meta-business process model without the loss of information that would have been inevitable if the model was subdivided into simpler but separate sub-models.

While providing a complete description of the business process, the e-EPC is essentially a descriptive tool and can be used to thoroughly describe a business process that is inefficient and badly designed as far as resource utilization is concerned.

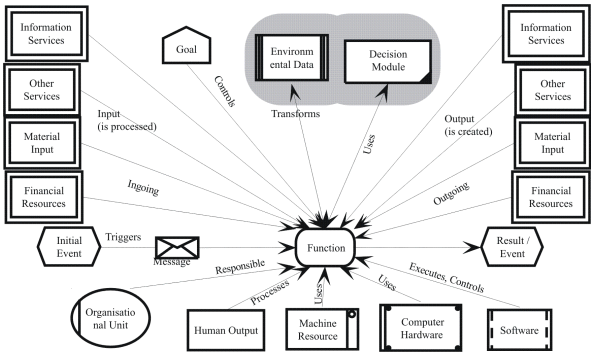
To ensure that this is not the case, process-modeling tools such as e-EPC should be equipped with certain friendliness towards possible choices of alternatives, or, in other words, should become "decision-aware". In particular, some of the lower level functional goals can include decision objectives necessary for the overall business goal to be achieved.

4 INTEGRATION OF BUSINESS MODELING TOOLS

The discussion above has highlighted the duality of decision modeling and process modeling paradigms. While tools within each paradigm have their own distinct mix of decision-making and process modeling capabilities, generally speaking decision models are likely to use quantitative methods. On the other hand, process models are highly descriptive and likely to use primarily qualitative methods.

Brans *et al* [1] describe how integration of quantitative decision models and decision structure models provides more powerful and realistic models of socio-economic systems. In the context of business modeling, the need to combine the two paradigms has been also identified by Shapiro [13] with a number of existing tools (such as Influence Diagram

Fig. 1 *Meta-business process model as appears in Scheer [11] extended to include Decision View.*



and Causal Loop Diagrams [2, 14]) already offering some level of integration. In this paper, a new conceptual tool a *Decision Enabled eEPC (de-EPC)* is formed to further integrate existing business modeling techniques by identifying decision objectives as a subset of functional goals and adding a *decision dimension* (*Decision View* illustrated in Figure 1) to the eEPC. The de-EPC will enable appropriate decision modeling techniques to be applied to provide the decision maker with an optimal decision for a particular function within a wider business context by using quantitative decision models to complement the descriptive power of the eEPC.

5 DISCUSSION

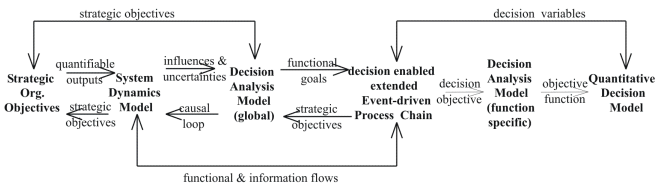
Both classes of business modeling tools are aimed at assisting the business to achieve its fundamental and operational objectives. Therefore, it is natural to attempt to integrate these tools and increase the capability of the business model by establishing the relationship between the objectives described by each of the tools. This relationship and the sequence of steps required for effective decision support within the context of business strategic objectives are summarized in Figure 2.

It is generally accepted [2, 11, 12, 13], that in order to model a business effectively, it is first necessary to identify key strategic objectives of the business. By translating the key strategic objectives into measurable outcomes or indicators it is possible to construct a diagram of a mental representation of the business using System Dynamics tools (e.g. a Causal Loop [14]) that will identify key inputs and outputs and relationships between them.

While System Dynamics tools do not explicitly specify the objectives, they provide the decision maker with sufficient information about the relationships between the key inputs and outputs to allow a Decision Analysis model (e.g. an Influence Diagram [2]) to be constructed. The Decision Analysis model constructed at the strategic level describes how the uncertainties and key variables influence the strategic objective.

The key variables will form lower level objectives supporting the strategic objective. These key variables can then be translated into functional goals of the de-EPC functional flows. Function flows, in turn, reflect the cause-and-effect relationships of the System Dynamics model. To ensure that de-EPC is decision enabled, the functional goals should include decision objectives where applicable.

Fig. 2 *Integrated framework for business modeling tools*



These decision objectives together with the decision variables, that form part of the de-EPC information flows, provide an input into a decision module (such as decision tree, linear programming model, etc. [16]). The output of the decision module provides the decision maker with an optimal path to satisfy the decision objective.

6 SUMMARY AND CONCLUSIONS

Discussion of the business-modeling paradigms has highlighted the duality currently existing in the field of business modeling. This duality can be formulated as follows: the more descriptive and contextual the business model, the less decision enabled it is. Integration of the two methods is aimed at decision enabling highly descriptive tools that can better support the nature of business problems.

This allows logical progression from the representation of the mental picture of the business to the precise and quantifiable knowledge enabling the best local decisions to be made in the context of the strategic objectives of the business. Although considerable future research effort is anticipated in order to provide full integration of process- and decision- oriented modeling paradigms and corresponding modeling tools, it is believed that the concept of a decision enabled business process modeling tool introduced in this paper, provides the solid basis for this effort.

REFERENCES

1. Brans, J. P., Macharis, C., Kunsch, P. L., Chevalier, A., Schwaninger, M.: Combining Multicriteria Decision Aid and System Dynamics for the Control of Socio-Economic Processes. An Iterative Real-Time Procedure. European Journal of Operational Research 109 (1998) 428-441

2. Clemen, R. T., Reilly, T.: Making Hard Decisions with DecisionTools. 2nd rev. edn. Duxbury, USA (2001)

3. Forrester, J. W.: Principles of Systems. 2nd rev. edn. Wright-Allen Press, Cambridge Massachusetts (1968)

4. French, S.: Readings in decision Analysis. St Edmundsbury Press Limited, Suffolk (1989)

5. Hirschheim, R., Heinz, K. K.: Four Paradigms of Information Systems Development. Communications of the ACM, Vol. 32 Number 10 (October 1989) 1199-1216

6. Howard, R. A., Matheson, J. E.: "Influence Diagrams". In Howard, R., Matheson, J. (editors): Readings on the Principles and Applications of Decision Analysis. Vol 2, Strategic Decisions Group, USA (1989) 719-762

7. Keller, G., Teufel, T.: SAP R/3 Process – Oriented Implementation: Iterative Process Prototyping. Harlow, Enlgand (1998) 602-611

8. Klaus, H., Rosemann, M., Gable, G. G.: What is ERP? Information Systems Frontiers 2:2. Kluwer Academic Publishers, Netherlands (2000)

9. Nilsson., A. G., Tolis, C. and Nellborn, C.: Perspectives on business modelling: understanding and changing organisation. Springer-Verlag, Berling, Heidelberg, New York (1999)

10. Santos, S. P., Belton, V. and Howick, S. : Integrating system dynamics and multicriteria analysis: towards organisational learning for performance improvement. Proceedings of the 19th International Conference of the System Dynamics Society. July, Georgia, USA (2001)

11. Scheer, A.-W.: ARIS – Business Process Frameworks. 3rd edn. . Springer-Verlag, Berlin Heidelberg (1999)

12. Scheer, A.-W.: ARIS – Business Process Modeling. 3rd edn. . Springer-Verlag, Berlin Heidelberg (2000)

13. Shapiro, J.: Beyond Supply Chain Optimization to Enterprise Optimization. ASCET Vol. 3, Montgomery Research Inc. (2001)

14. Sterman, J. D.: Business Dynamics: Systems Thinking and Modelling for a Complex World. The McGraw-Hill Companies, USA (2000)

15. van der Aalst, W., Desel, J. and Oberweis, A.: Business process management: models, techniques, and empirical studies. Springer-Verlag, Berlin, Heidelberg. (2000)

16. Winston, W. L.: Operations Research: Applications and Algorithms. Wadsworth, USA (1994)